

## AMENDMENTS TO THE CLAIMS

Please replace the pending claims with the following claim listing:

1. **(Currently Amended)** An optical functional circuit in which a plurality of circuit elements are formed on a substrate, comprising:

a wave propagation medium for converting an optical path of a leakage light that is not emitted from a predetermined output port of the circuit element so as to prevent the leakage light from being coupled to a different circuit element,

wherein the wave propagation medium comprises an optical waveguide, which is provided with a clad layer formed on the substrate and a core embedded in the clad layer, ~~and a part of the optical waveguide is formed in accordance with a~~ the wave propagation medium has a spatial refractive index distribution ~~which is multiple-scattered for outputting the leakage light launched into the circuit element to other port as output-light with multiple scattering through the wave propagation medium.~~

said spatial refractive index distribution is designated by each refractive index of pixels defined by a mesh, said each refractive index of the pixels is determined by calculating a phase difference between a forward propagation of the input field of the leakage light and a reverse propagation of the output field of the output-light at each pixel and repeating calculations until said phase difference becomes less than a desired value.

2. **(Canceled)**

3. **(Original)** The optical functional circuit according to claim 1, wherein the refractive index distribution of the wave propagation medium is determined by modulating a width of the optical waveguide in an optical axis direction.

4. **(Currently Amended)** An optical functional circuit ~~including a wave propagation medium which is constituted by~~ having an optical waveguide provided with a clad layer formed on a substrate and a core portion embedded in the clad layer, and a part of the optical waveguide is formed in accordance with a refractive index distribution which is multiple scattered, said optical functional circuit being characterized in that comprising:

a wave propagation medium for outputting input-light that is launched into an input port to an output port as output-light, said input port and output port each being defined as a location of a circuit at which a cross section of a field of said input-light or said output-light is given in a cross section perpendicular to a propagation direction of said input-light,

wherein the wave propagation medium has a spatial refractive index distribution for outputting the input-light launched into the input port to the output port as the output-light with multiple scattering through the wave propagation medium,

said spatial refractive index distribution is designated by each refractive index of pixels defined by a mesh, said each refractive index of the pixels is determined by calculating a phase difference between a forward propagation of the input field of the input-light and a reverse propagation of the output field of the output-light at each pixel and repeating calculations until said phase difference becomes less than a desired value,

in order that among optical signals made incident from ~~an~~ the input port defined in the wave propagation medium, a stray light that is not emitted from a predetermined output port defined in the wave propagation medium is not coupled to a different output port, an optical axis of the input port and an optical axis of the predetermined output port are arranged so as not to be made coincident with each other.

5. **(Currently Amended)** The optical functional circuit according to claim 4, wherein, assuming that it is a half value  $\theta$  of a beam divergence angle of the ~~incident~~ input-light from the input port, the predetermined output port is arranged outside a region sandwiched between two lines of an angle  $\theta$  from the input port, with respect to the optical axis of the input port.

6. **(Currently Amended)** An optical functional circuit ~~including a wave propagation medium constituted by a~~ having an optical waveguide which is provided with a clad layer formed on a substrate and a core portion embedded in the clad layer ~~and in which a part of the optical waveguide is formed in accordance with a refractive index distribution which is multiple-scattered,~~ said optical functional circuit being characterized in that layer, comprising:

a wave propagation medium for outputting input-light that is launched into an input port to an output port as output-light, said input port and output port each being defined as a location of a circuit at which a cross section of a field of said input-light or said output-light is given in a cross section perpendicular to a propagation direction of said input-light,

wherein the wave propagation medium has a spatial refractive index distribution for outputting the input-light launched into the input port to the output port as the output-light with multiple scattering through the wave propagation medium,

said spatial refractive index distribution is designated by each refractive index of pixels defined by a mesh, said each refractive index of the pixels is determined by calculating a phase difference between a forward propagation of the input field of the input-light and a reverse propagation of the output field of the output-light at each pixel and repeating calculations until said phase difference becomes less than a desired value,

wherein on the substrate, positioning markers for defining input and output ports defined in the wave propagation medium are formed, and

(a) the positioning markers, which are formed on members having optical parts optically coupled to the input and output ports and define light focusing positions of the optical parts, and (b) the positioning markers for defining the input and output ports are aligned, thereby coupling the input and output ports and the optical parts optically.

7. **(Currently Amended)** An optical functional circuit ~~including a wave propagation medium constituted by~~ having an optical waveguide which is provided with a clad layer formed on a substrate and a core portion embedded in the clad layer, ~~and a part of the optical waveguide is formed in accordance with a refractive index distribution which is multiple scattered, said optical functional circuit being characterized in that~~ comprising:

a wave propagation medium for outputting input-light that is launched into an input port to an output port as output-light, said input port and output port each being defined as a location of a circuit at which a cross section of a field of said input-light or said output-light is given in a cross section perpendicular to a propagation direction of said input-light,

wherein the wave propagation medium has a spatial refractive index distribution for outputting the input-light launched into the input port to the output port as the output-light with multiple scattering through the wave propagation medium,

said spatial refractive index distribution is designated by each refractive index of pixels defined by a mesh, said each refractive index of the pixels is determined by calculating a phase difference between a forward propagation of the input field of the input-light and a reverse propagation of the output field of the output-light at each pixel and repeating calculations until said phase difference becomes less than a desired value,

wherein on the substrate, monitoring waveguides for defining input and output ports defined in the wave propagation medium are formed from an end facet on which the input port is formed to an end facet on which the output port is formed, and

(a) optical fibers for positioning, which are formed on members having optical parts optically coupled to the input and output ports and define light focusing positions of the optical parts, and (b) the monitoring waveguides are aligned, thereby coupling the input and output ports and the optical parts optically.

8. **(Previously Presented)** The optical functional circuit according to claim 6, wherein the optical part which is coupled to at least one of the input and output ports is an optical fiber, and the member is a glass block for fixing the optical fiber.

9. **(Previously Presented)** The optical functional circuit according to claim 6, wherein the optical part which is coupled to at least one of the input and output ports is any of a light emitting element and a light receiving element, and the wave propagation medium is the wave propagation medium serving as a light collecting lens.

10. **(Previously Presented)** The optical functional circuit according to claim 6, wherein the optical part which is coupled to at least one of the input and output ports is an optical waveguide, and the wave propagation medium is the wave propagation medium for mode field conversion.

11. **(Previously Presented)** The optical functional circuit according to claim 7, wherein the optical part which is coupled to at least one of the input and output ports is an optical fiber, and the member is a glass block for fixing the optical fiber.

12. **(Previously Presented)** The optical functional circuit according to claim 7, wherein the optical part which is coupled to at least one of the input and output ports is any of a light emitting element and a light receiving element, and the wave propagation medium is the wave propagation medium serving as a light collecting lens.

13. **(Previously Presented)** The optical functional circuit according to claim 7, wherein the optical part which is coupled to at least one of the input and output ports is an optical waveguide, and the wave propagation medium is the wave propagation medium for mode field conversion.